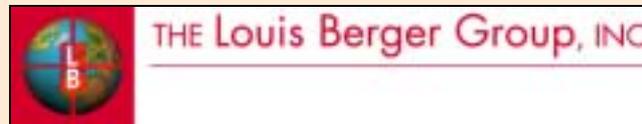


**Segment 2204 of the Petronila Creek
Chloride, Sulfate, Total Dissolved Solids
Total Maximum Daily Load Development**

Robstown, Texas

**Meeting #1
December 9, 2003**



Objectives

- To explain the TMDLs: What is? Why? Which segment? How?
- To present and review the steps and the data used in the development of the TMDL for the listed segment 2204 of the Petronila Creek.

Why Develop TMDLs?

Requirements of 1972 Clean Water Act:

- States are required to identify impaired waters
- Section 303(d) of the Clean Water Act:
 - Requires states to periodically list impaired waters
 - Requires TMDLs development for impaired waters

EPA in litigation for failure to promulgate Section 303(d) of the Clean Water Act.

What is a TMDL?

- A TMDL (Total Maximum Daily Load) establishes the maximum amount of an impairing substance or stressor that a waterbody can assimilate and still meet Water Quality Standards and allocates that load among pollution contributors.
- TMDLs are a tool for implementing State water quality standards. They are based on the relationship between pollution sources and in-stream water quality conditions.
- A TMDL addresses a single pollutant or stressor for each waterbody.

Which Waterbodies Require TMDLs?

Waterbodies require TMDLs when the pollution control requirements are not stringent enough to meet applicable Water Quality Standards.

How are TMDLs Calculated?

- A TMDL is the sum of the allowed pollutant loads for point sources, non-point sources, a margin of safety, and projected growth.
- $\text{TMDL} = \text{Point Sources} + \text{Nonpoint Sources} + \text{Margin of Safety}$

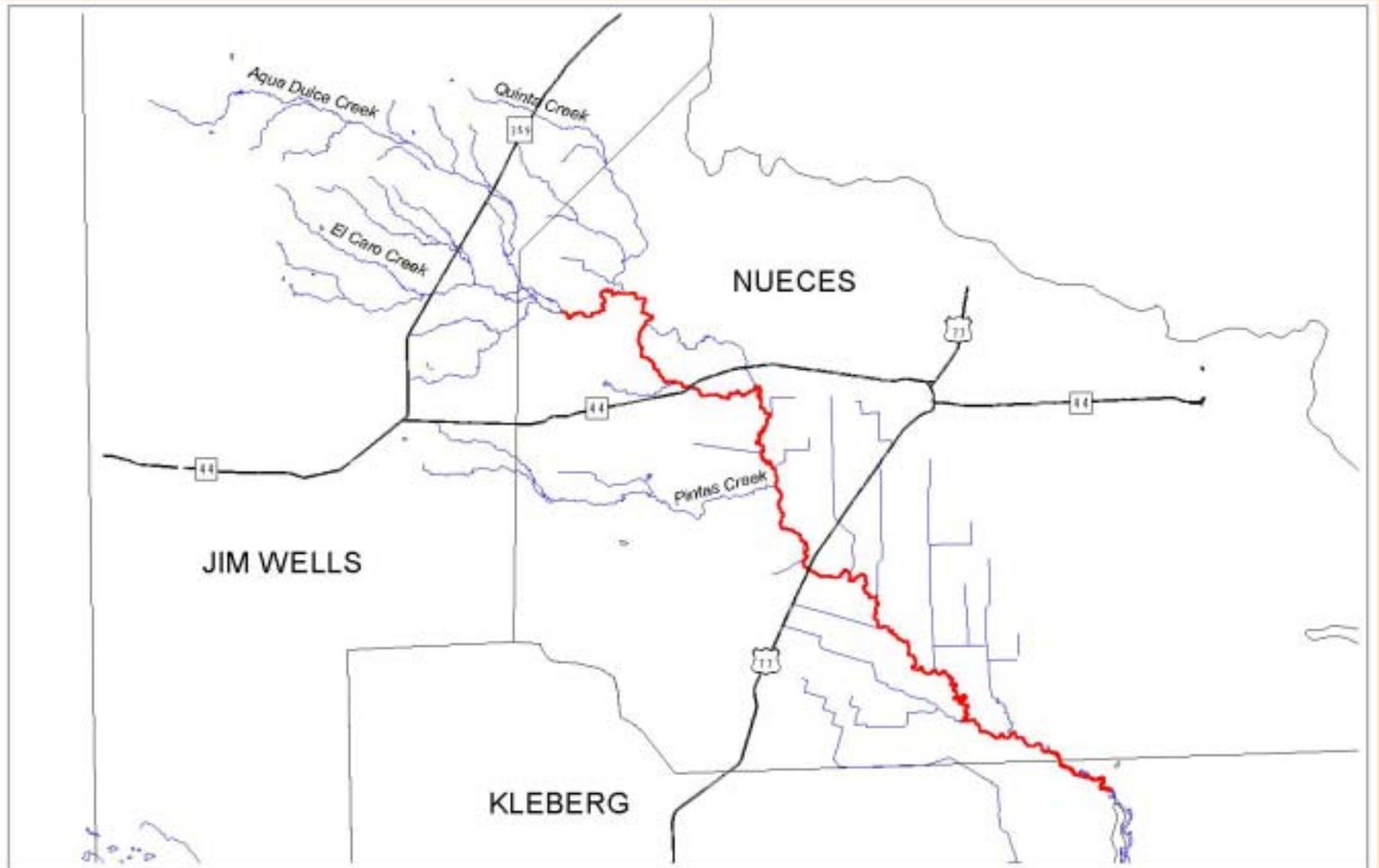
TX Water Quality Standards

- Chloride, Sulfate, Total Dissolved Solids Impairment
- Appendix A: Water Uses and Numeric Criteria
 - Chloride = 1,500 mg/L
 - Sulfate = 500 mg/L
 - Total Dissolved Solids = 4,000 mg/L

What is a TMDL?

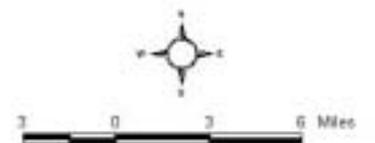
A Special Study to:

- Identify the sources of pollution contributing to violation of water quality standards.
- Calculate the amount of pollutant loads entering the stream from each source.
- Calculate the reductions in pollutant loads, by source, needed to attain/maintain the water quality standards.
- Must include a margin of safety.



-  Major Roads
-  Petronila Creek Listed Segment
-  Tributaries HUC 12110285
-  County Boundaries

Petronila Creek (Segment Number 2204)
Listed Segment



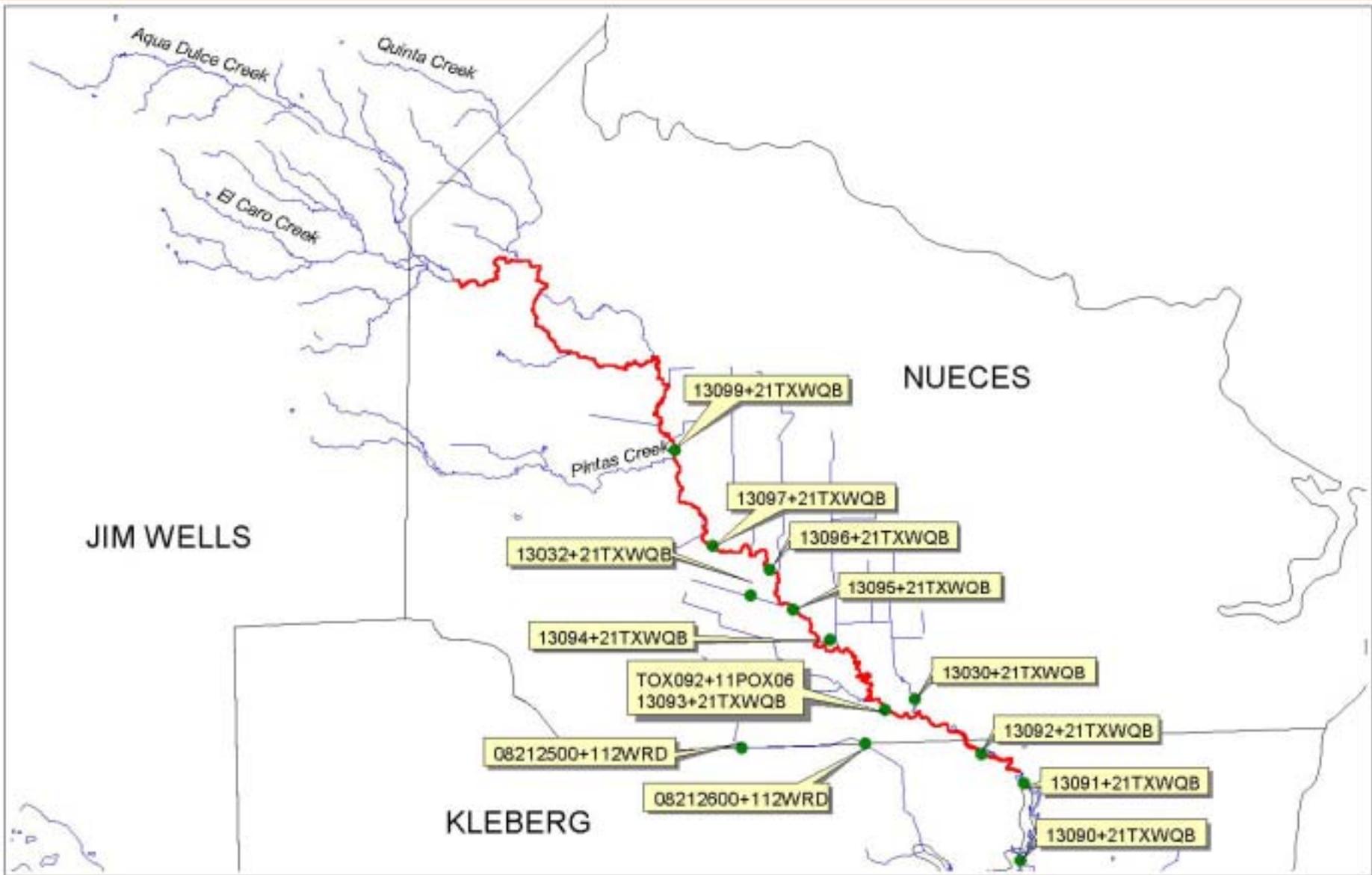
Petronila Creek Listed Segment

Based on the 2000 303(d) List

- **Upstream Limit:**
 - Confluence of Aqua Dulce and Banquete Creeks.
- **Downstream Limit:**
 - A point 0.6 miles upstream of private road crossing near the Laureles Ranch in Kleberg County.
- **Segment Length:**
 - 44 miles



Environmental Monitoring



Petronila Creek (Segment Number 2204)
Water Quality Monitoring Stations

- Water Quality Stations
- Petronila Creek Listed Segment
- Tributaries HUC 12110265
- County Boundaries



Summary of Water Quality Conditions: Chloride

| Station | Period of Record | # of Samples | No. of violations | Percent of time exceed the standard |
|----------------|-------------------------|---------------------|--------------------------|--|
| 13094 | May 95- Oct 03 | 30 | 26 | 86.7 |
| 13096 | Oct 95 - Oct 03 | 10 | 8 | 80.0 |
| 13030 | Jan 03 - Oct 03 | 6 | 4 | 66.7 |
| 13032 | Jan 03 - Oct 03 | 5 | 3 | 60.0 |
| 13093 | Jan 03 - Oct 03 | 6 | 4 | 66.7 |
| 13095 | Jan 03 - Oct 03 | 6 | 4 | 66.7 |
| 13098 | May 03 - Oct 03 | 4 | 1 | 25.0 |
| 13099 | Jan 03 - Oct 03 | 4 | 1 | 25.0 |
| 14944 | Oct 95 - Jun 96 | 4 | 0 | 0.0 |
| 17658 | Aug-03 | 2 | 0 | 0.0 |
| 17659 | Aug-03 | 2 | 0 | 0.0 |
| 17660 | Aug-03 | 2 | 0 | 0.0 |

Summary of Water Quality Conditions: Sulfate

| Station | Period of Record | # of Samples | No. of violations | Percent of time exceed the standard |
|----------------|-------------------------|---------------------|--------------------------|--|
| 13094 | May 95 - Oct 03 | 30 | 14 | 46.7 |
| 13096 | Jan 96 - Oct 03 | 10 | 6 | 60.0 |
| 13030 | Jan 03 - Oct 03 | 6 | 4 | 66.7 |
| 13032 | Jan 03 - Oct 03 | 5 | 3 | 60.0 |
| 13093 | Jan 03 - Oct 03 | 6 | 4 | 66.7 |
| 13095 | Jan 03 - Oct 03 | 6 | 4 | 66.7 |
| 13098 | May 03 - Oct 03 | 4 | 1 | 25.0 |
| 13099 | Jan 03 - Oct 03 | 4 | 1 | 25.0 |
| 14944 | Oct 95 - Jun 96 | 4 | 0 | 0.0 |
| 17658 | Aug-03 | 2 | 0 | 0.0 |
| 17659 | Aug-03 | 2 | 0 | 0.0 |
| 17660 | Aug-03 | 2 | 0 | 0.0 |

Summary of Water Quality Conditions: TDS

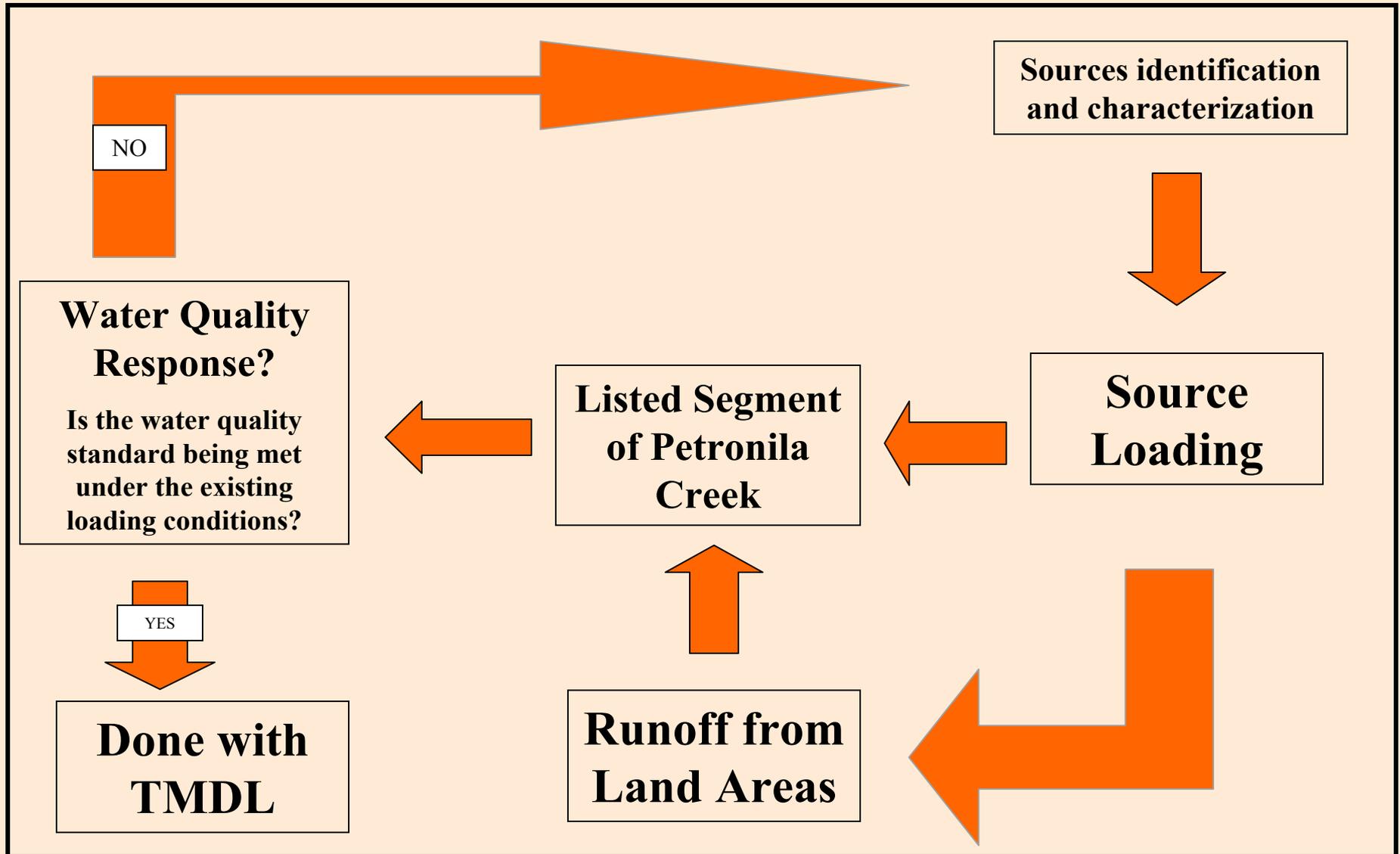
| Station | Period of Record | No. of Samples | No. of violations | Percent of time exceed the standard |
|----------------|-------------------------|-----------------------|--------------------------|--|
| 13094 | Apr 94 - Oct 03 | 33 | 27 | 81.8 |
| 13096 | Oct 95 - Oct 03 | 10 | 8 | 80.0 |
| 13030 | Jan 03 - Oct 03 | 6 | 4 | 66.7 |
| 13032 | Jan 03 - Oct 03 | 5 | 3 | 60.0 |
| 13093 | Jan 03 - Oct 03 | 6 | 4 | 66.7 |
| 13095 | Jan 03 - Oct 03 | 6 | 4 | 66.7 |
| 13098 | May 03 - Oct 03 | 4 | 1 | 25.0 |
| 13099 | Nov 97 - Oct 03 | 7 | 1 | 14.3 |
| 17658 | Aug-03 | 2 | 0 | 0.0 |
| 17659 | Aug-03 | 2 | 0 | 0.0 |
| 17660 | Aug-03 | 2 | 0 | 0.0 |

TMDL Process

TMDL Development Process

1. Define the problem
2. Define the numeric targets for the pollutant
3. Identify and characterize pollutant sources
4. Estimate loadings under the existing conditions
5. Evaluate the linkage between the pollutant sources and instream response
6. Develop allocation scenarios that meet the water quality standards
7. Develop a follow up monitoring plan
8. Develop an implementation plan

TMDL Process



Data and Information Needs...

- Watershed Physiographic data
- Hydrographic data
- Weather data
- Watershed activities/use data and information related to **pollutant** production
- Point sources and direct discharge data and information
- Environmental Monitoring data
- Stream Flow data

Data Inventory

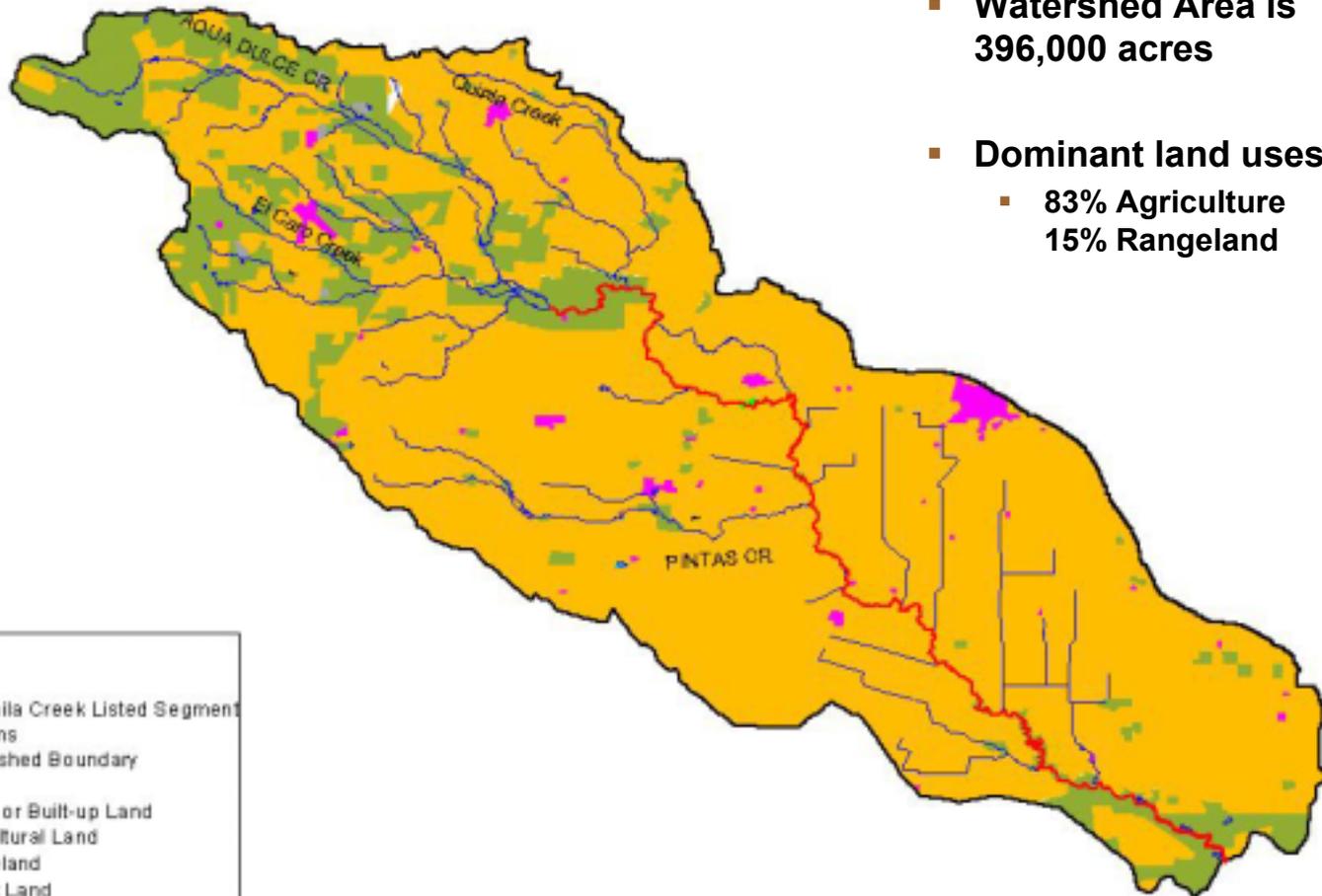
| Data Category | Description | Potential Source(s) |
|---|---|--|
| Watershed physiographic data | Watershed boundary | USGS, TCEQ |
| | Land use/land cover | BASINS, MRLC, NLCD, TCEQ |
| | Soil data (SSURGO, STATSGO) | USDA, NRCS |
| | Topographic data (USGS-30 meter DEM, USGS Quads) | USGS, TCEQ |
| Hydrographic data | 1. Stream network and reaches (RF3) | BASINS, TCEQ, Field determination |
| | 2. Stream channel morphology | |
| Weather data | Hourly meteorological conditions | NOAA NCDC, Earth Info, local airports, weather stations, and colleges and universities |
| Watershed activities/ uses data and information related to pollutant Production | Compile information, data, reports, and maps that can be used to support CL, TDS and Sulfate source identification and loading. Address the following issues: | TCEQ, River Authorities, TSSWCB, RRC, and other State, County and Local agencies |
| | ▪ Leaking oil wells | |
| | ▪ Brine Pits | |
| | ▪ Brine injection | |
| | ▪ Phreatophytic Brush | |
| ▪ Salt deposits (geological source) | | |
| Point sources and direct discharge data and information | Permitted facilities locations and discharge monitoring reports (DMR) | US EPA Permit Compliance System (PCS), TCEQ |
| Environmental monitoring data | Station locations and ambient instream monitoring data | TCEQ, Monitoring Plan, River Authorities |
| Stream flow data | Gaging station location and continuous flow data | USGS, TCEQ, River Authorities |

Watershed Physiographic Data:

| Description | Potential Source(s) |
|---|----------------------------|
| Watershed boundary | USGS, TCEQ |
| Land use/land cover | USGS, TCEQ |
| Soil data (SSURGO, STATSGO) | USDA, NRCS |
| Topographic data (USGS-30 meter DEM, USGS Quads) | USGS |

Petronila Creek 2204

- **Watershed Area is 396,000 acres**
- **Dominant land uses**
 - 83% Agriculture
 - 15% Rangeland



**Petronila Creek (Segment Number 2204)
Land Use/Land Cover**



Segment 2204 Land Use Data

| Land Use | | Acres | Percent | Total Percent |
|--------------|-------------------------|---------|---------|---------------|
| Urban | RESIDENTIAL | 2,094 | 0.5 | 1.2 |
| | COMMERCIAL AND SERVICES | 614 | 0.2 | |
| | INDUSTRIAL | 734 | 0.2 | |
| | TRANS, COMM, UTIL | 663 | 0.2 | |
| | MXD URBAN OR BUILT-UP | 540 | 0.1 | |
| | OTHER URBAN OR BUILT-UP | 64 | 0.0 | |
| Agricultural | CROPLAND AND PASTURE | 329,048 | 83.0 | 83.1 |
| | CONFINED FEEDING OPS | 45 | 0.0 | |
| | OTHER AGRICULTURAL LAND | 503 | 0.1 | |
| Rangeland | HERBACEOUS RANGELAND | 13,704 | 3.5 | 15.4 |
| | SHRUB & BRUSH RANGELAND | 31,338 | 7.9 | |
| | MIXED RANGELAND | 16,100 | 4.1 | |
| Forest | DECIDUOUS FOREST LAND | 111 | 0.03 | 0.03 |
| | EVERGREEN FOREST LAND | 1 | 0.00 | |
| Water | LAKES | 19 | 0.00 | 0.0 |
| | RESERVOIRS | 22 | 0.01 | |
| Wetland | NONFORESTED WETLAND | 52 | 0.01 | 0.01 |
| Barren | STRIP MINES | 768 | 0.2 | 0.2 |
| | | | | |
| | Total | 396,419 | 100.0 | 100 |

Hydrographic data:

| Description | Potential Source(s) |
|---|----------------------------|
| Stream network and reaches (RF3) | BASINS, NHD, TCEQ |
| Stream Channel Morphology | Field Survey |



-  Petronile Creek Listed Segment
-  Streams
-  Watershed Boundary
-  Subwatersheds
-  Counties

**Petronila Creek (Segment Number 2204)
Subwatersheds**



Weather data:

| Description | Potential Source(s) |
|---|--|
| Hourly meteorological conditions | NOAA NCDC, Earth Info, local airports and weather stations. |

Watershed activities/uses data and information related to Chloride and Sulfate production:

Compile information, data, reports, and maps that can be used to support the source identification and loading.

Address the pollutant loading from the following:

- Human Sources
 - Permitted Sources (facilities, brine pits and injection, leaking wells)

- Natural Sources
 - Geologic Formations
 - Biological Sources

Potential Sources Characterization

| Source | Receiving Water | | | | Response |
|------------------------|-----------------|----------|-------------|------|----------|
| | Surface Water | | Groundwater | | |
| | Direct | Indirect | Shallow | Deep | |
| | | | | | |
| Permitted Point source | X | | | | F |
| Brine Pit | | X | | | F |
| | | | X | | M |
| Leaking oil well | | | X | | M |
| Brine Injection | | | X | | M |
| | | | | X | S |
| Phreatophytic Brush | | X | X | | M |
| Salt Deposits | | X | X | | M |

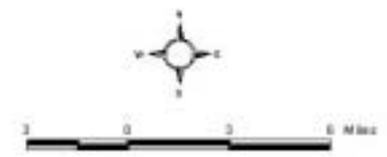
Point sources and direct discharge data and information:

| Description | Potential Source(s) |
|--|--|
| Permitted facilities locations and discharge monitoring reports (DMR) | US EPA Permit Compliance System (PCS), Texas Pollutant Discharge Elimination System (TPDES), TCEQ |



- Permitted Point Sources
- Listed Segment #2204
- Streams

Petronila Creek (Segment 2204) Permitted Point Sources



Environmental monitoring data:

| Description | Potential Source(s) |
|---|---|
| Station locations and ambient instream monitoring data | TCEQ |
| | TCEQ |
| Special Studies | Colleges and universities, Local project surveys, Local knowledge based on communications with local groups and stakeholders |

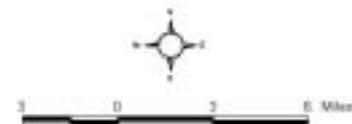
Water Quality Data Analysis

- Locations of sources and WQ Stations
- Data Analysis
 - Flow and pollutants relations and trends

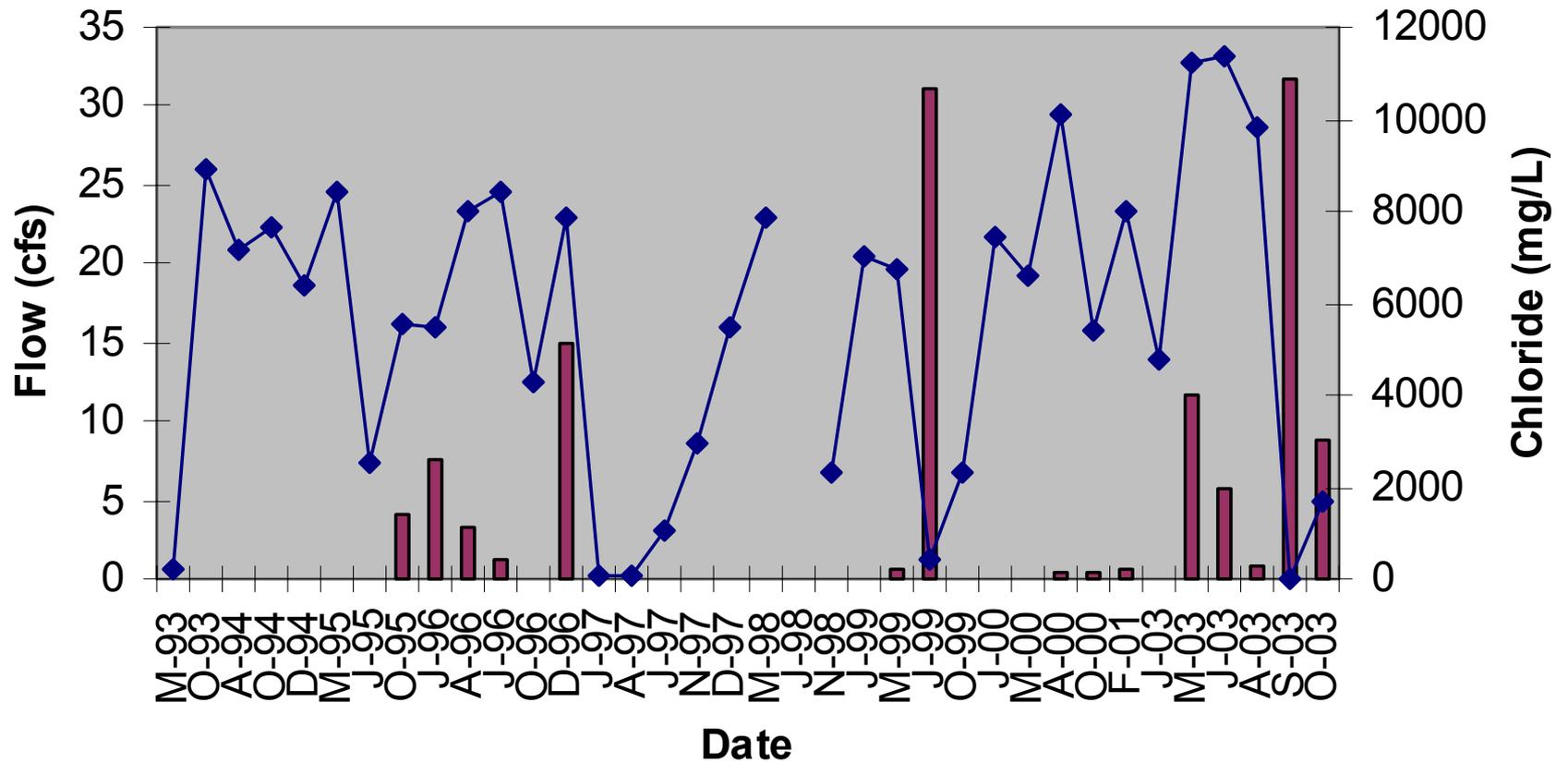


- Water Quality Stations
- Petronila Creek Listed Segment
- Tributaries RUC 12119205
- County Boundaries

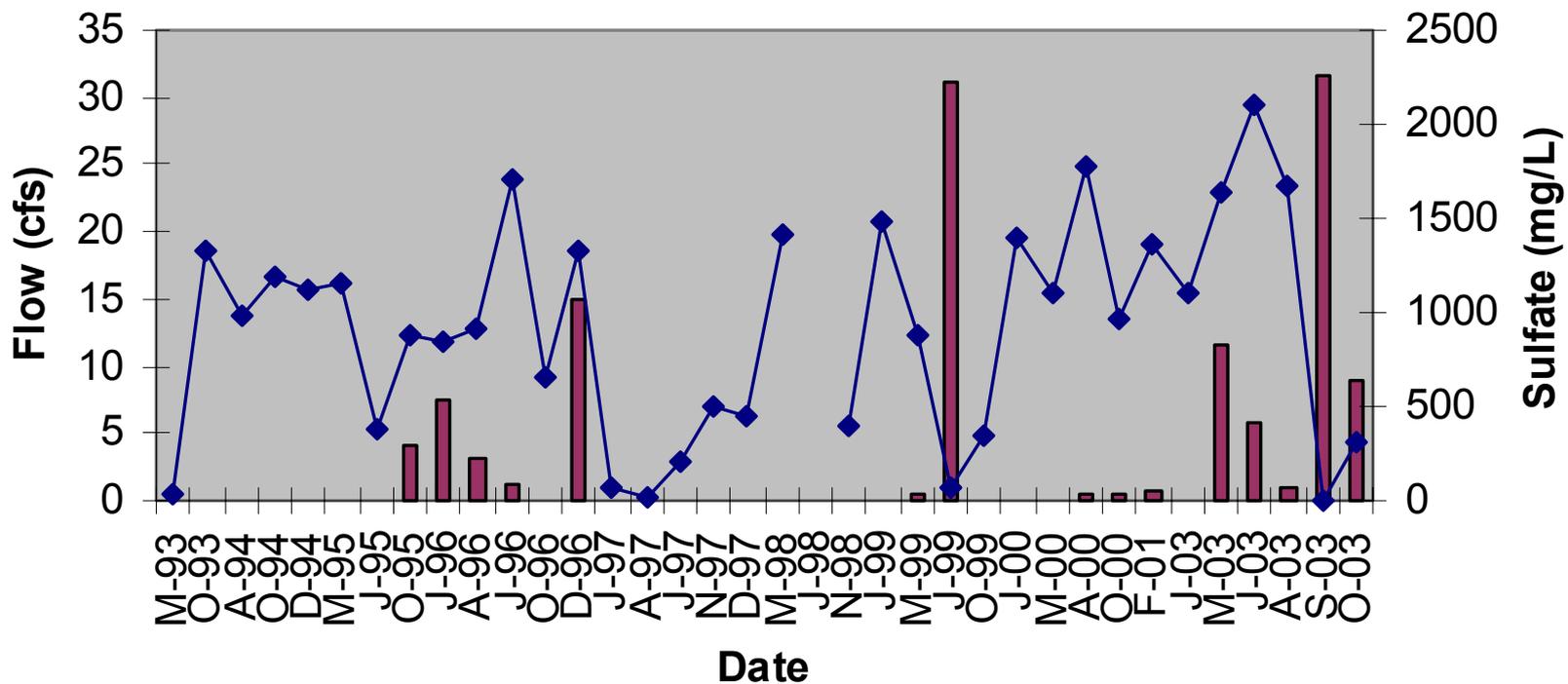
Petronila Creek (Segment Number 2204)
Water Quality Monitoring Stations



Petronila Creek: Station 13094

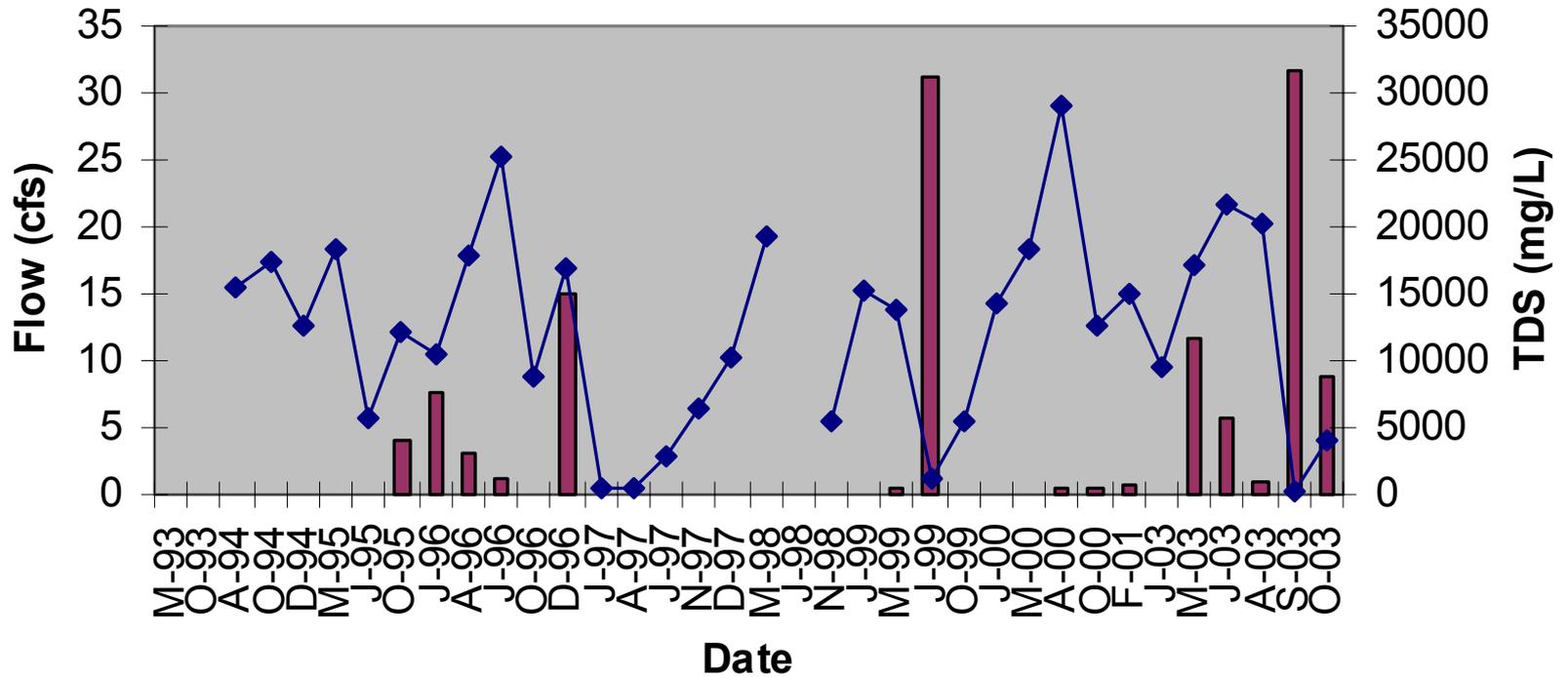


Petronila Creek: Station 13094



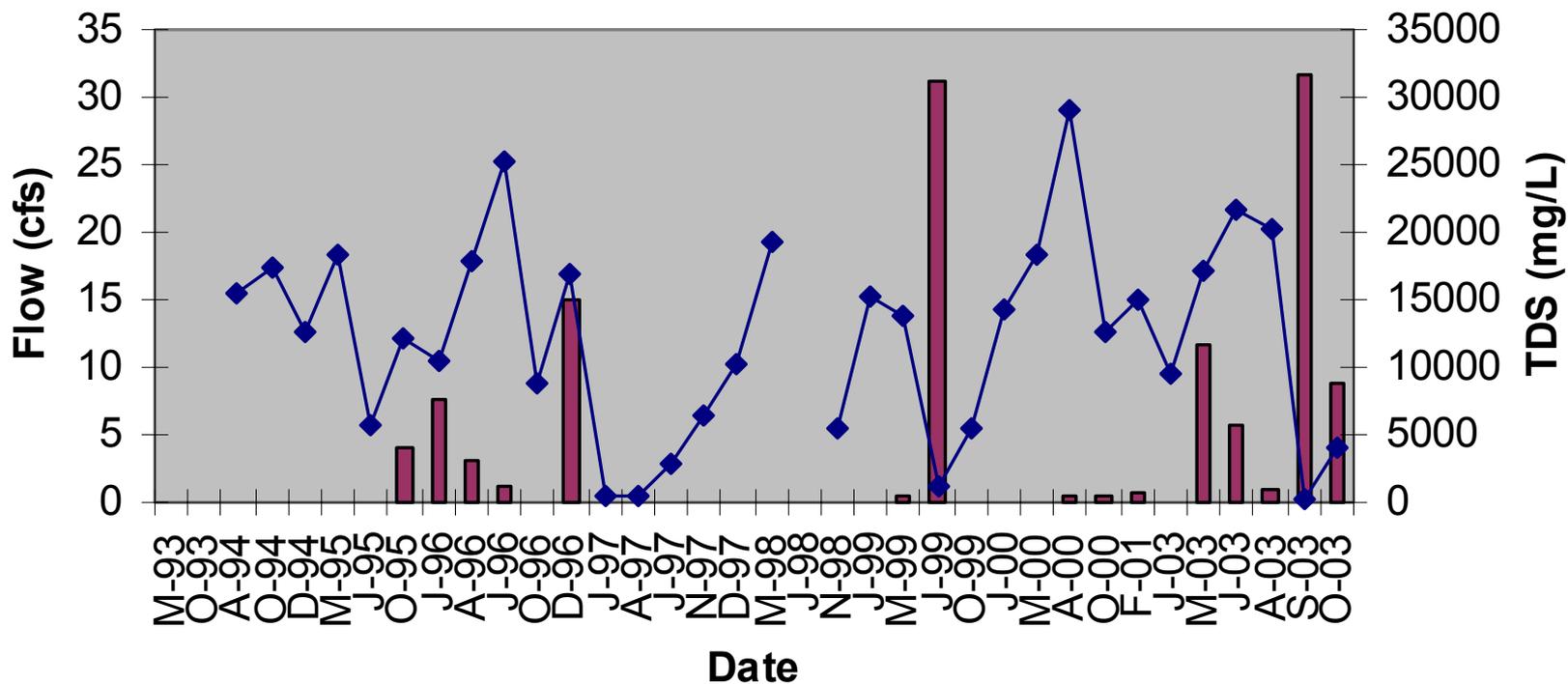
Petronila Creek: Station 13094

Flow TDS

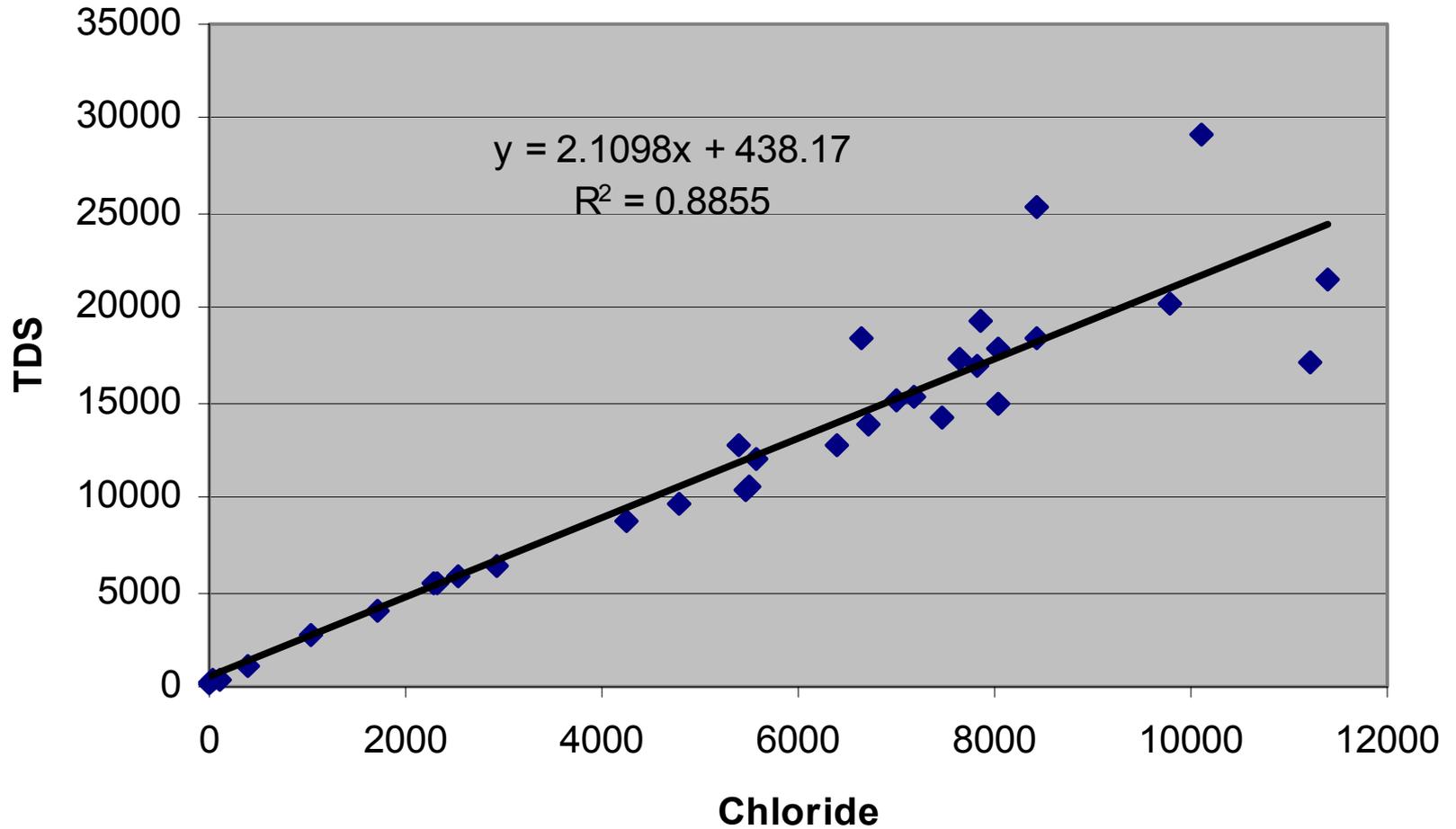


Petronila Creek: Station 13094

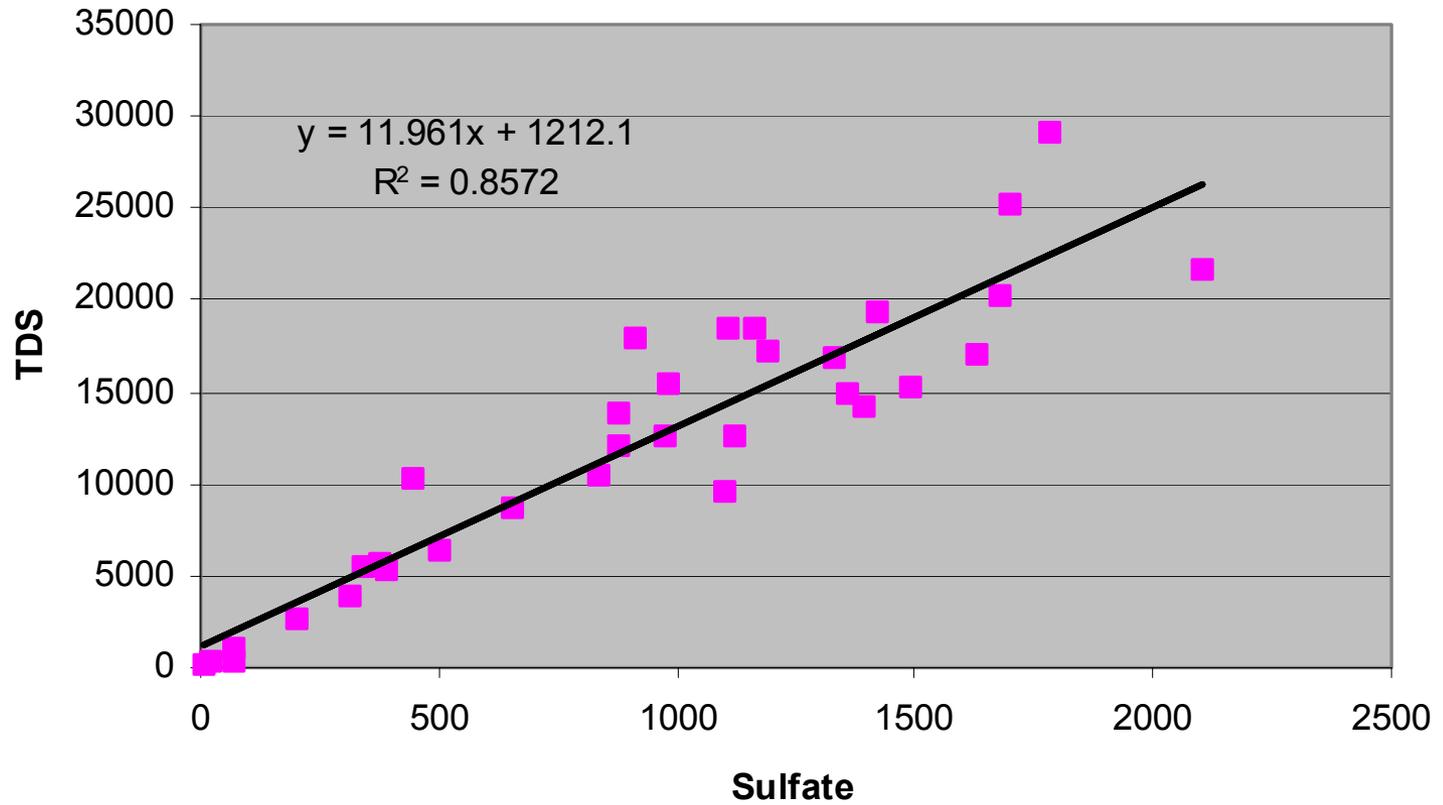
Flow TDS



Petronila Creek: Station 13094

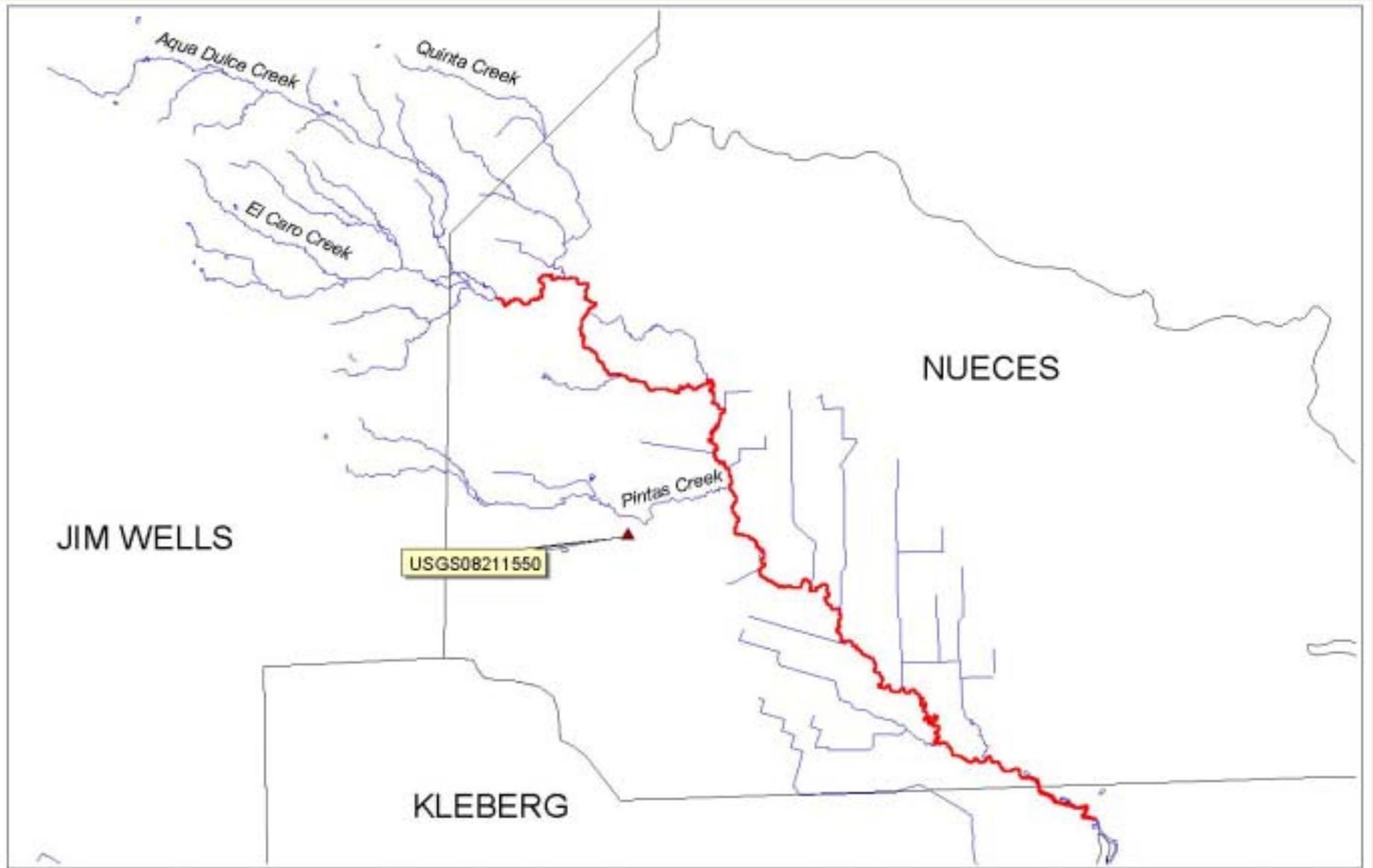


Petronila Creek: Station 13094



Stream flow data:

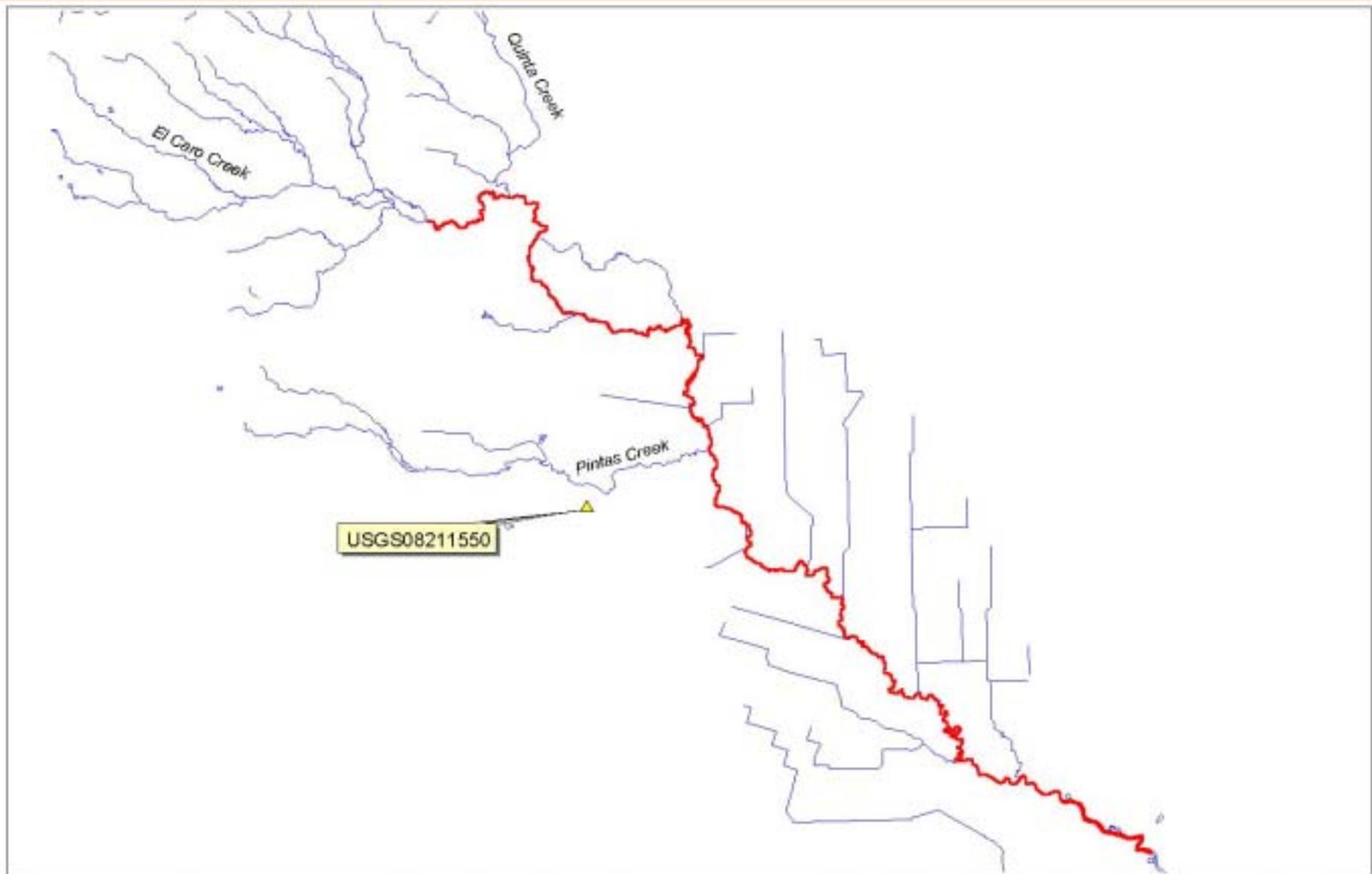
| Description | Potential Source(s) |
|---|----------------------------|
| Gaging station location and continuous flow data | USGS, TCEQ |



- ▲ USGS Flow Monitoring Stations
- ~ Petronila Creek Listed Segment
- ∧ Tri-States HUC 12110205
- County Boundaries

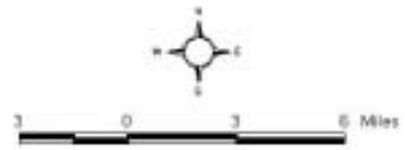
Petronila Creek (Segment Number 2204)
USGS Flow Monitoring Stations





-  Flow Monitoring Stations
-  Listed Segment #2204
-  Streams

**Petronila Creek (Segment Number 2204)
Proposed Flow Monitoring Stations**



Source Loading Estimates

"Total Available Load"

Sources Loading Estimates

- Determine the daily pollutant production by source
- Estimate the size/number of each source
- Determine whether the source is
 - Direct Source
 - Indirect Source
- Calculate the load to each land use based on a monthly schedule and for each source
- The sum of all the individual sources is the total load

Next Steps

- Identify data needs
- Collect available data
- Analyze data to investigate the impairment in the watershed
- Source loading estimates
- Develop the watershed model input parameters
- Prepare for the Public Meeting

Local TMDL Contacts

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